



Main Injector Lattice Measurement at 120 GeV

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Study

❖ Take data on \$29

- ▶ TLG module #37.
- ▶ Beam to MI dump.

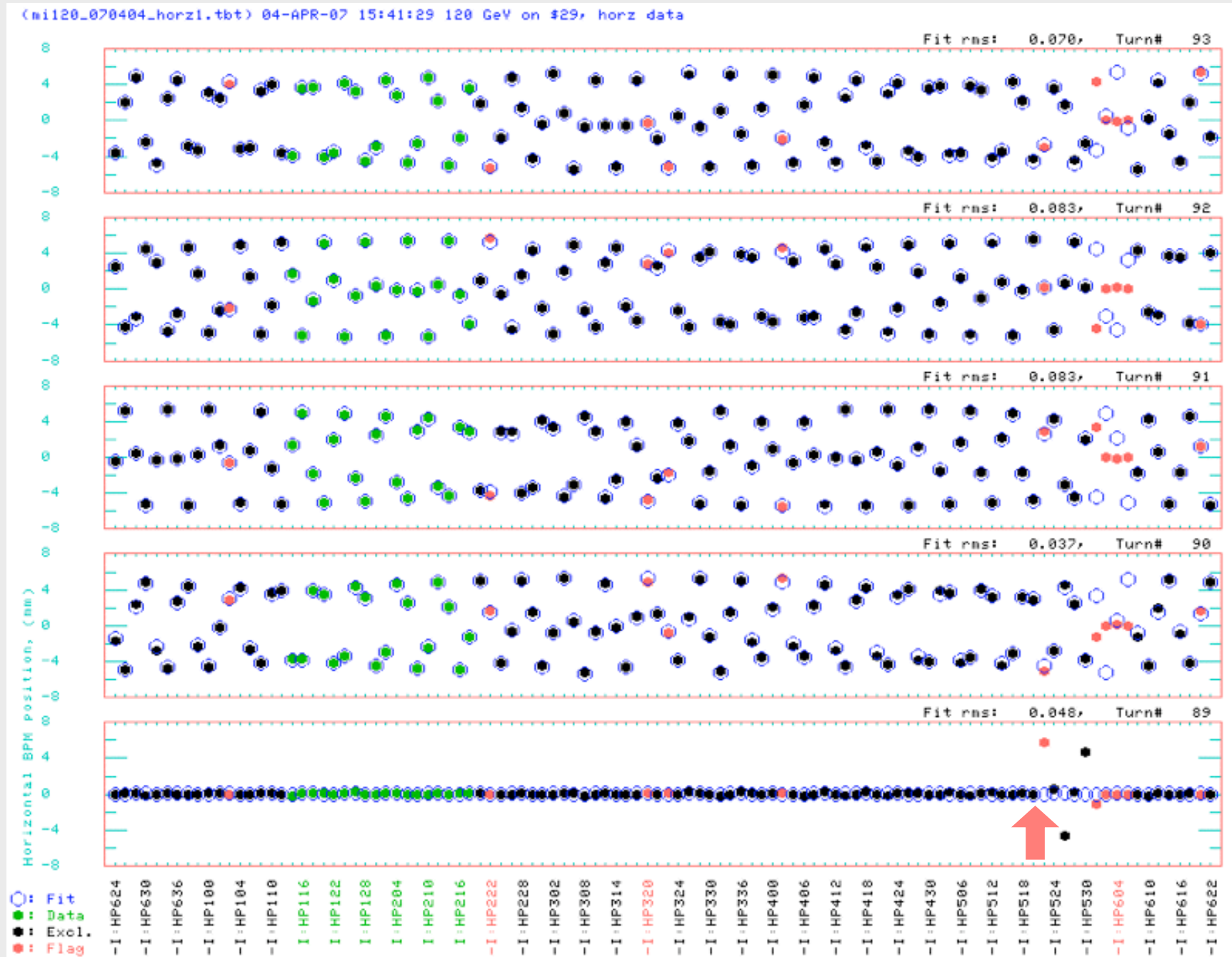
❖ Horizontal plane

- ▶ Use MI52 kicker
- ▶ Pinged beam at flat-top, 10 KV.
 - ~6 mm oscillation.

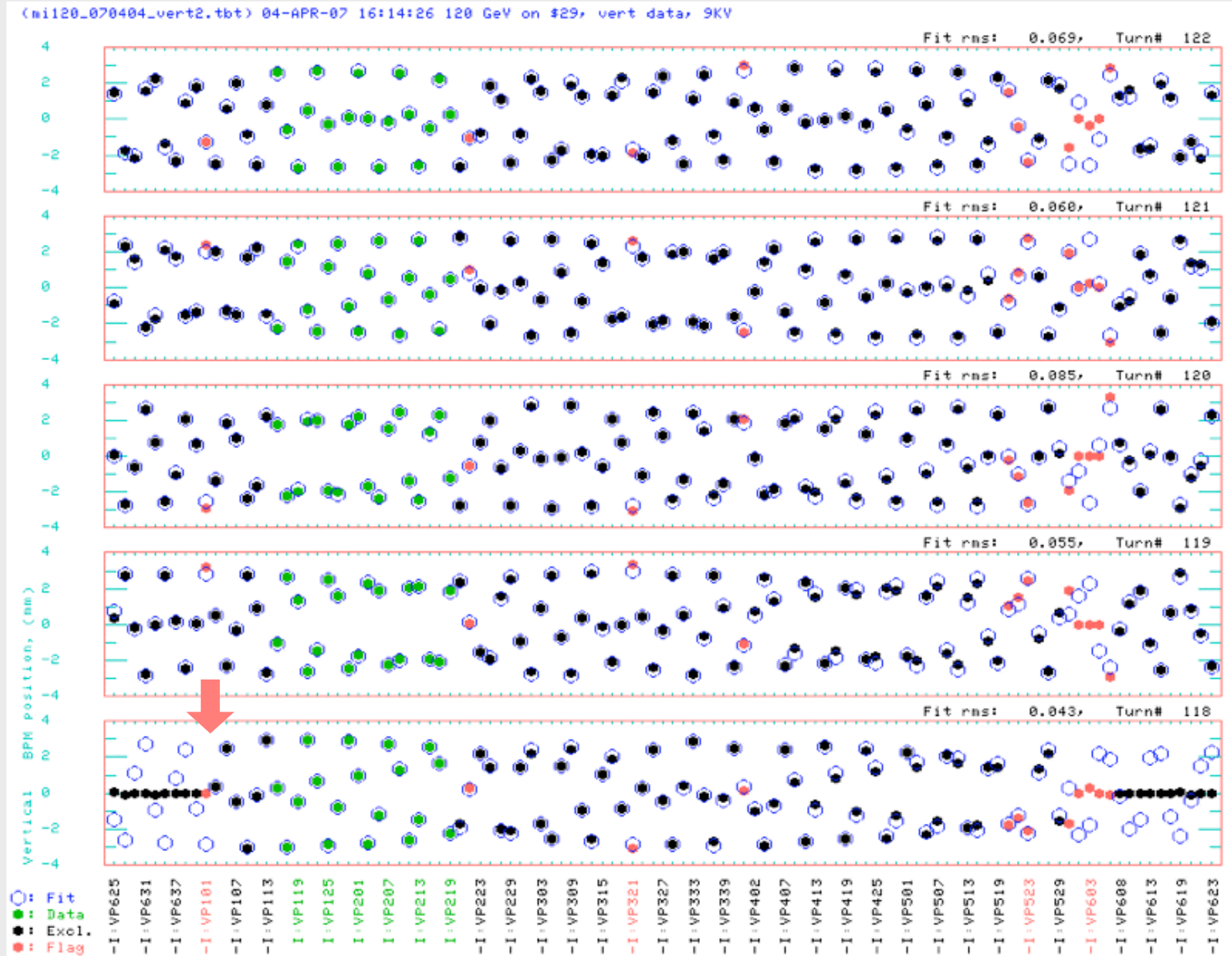
❖ Vertical plane

- ▶ Use all 3 MI10 kickers.
- ▶ Total kick of 9KV, i.e 3KV for each kicker.
 - ~3 mm oscillation.

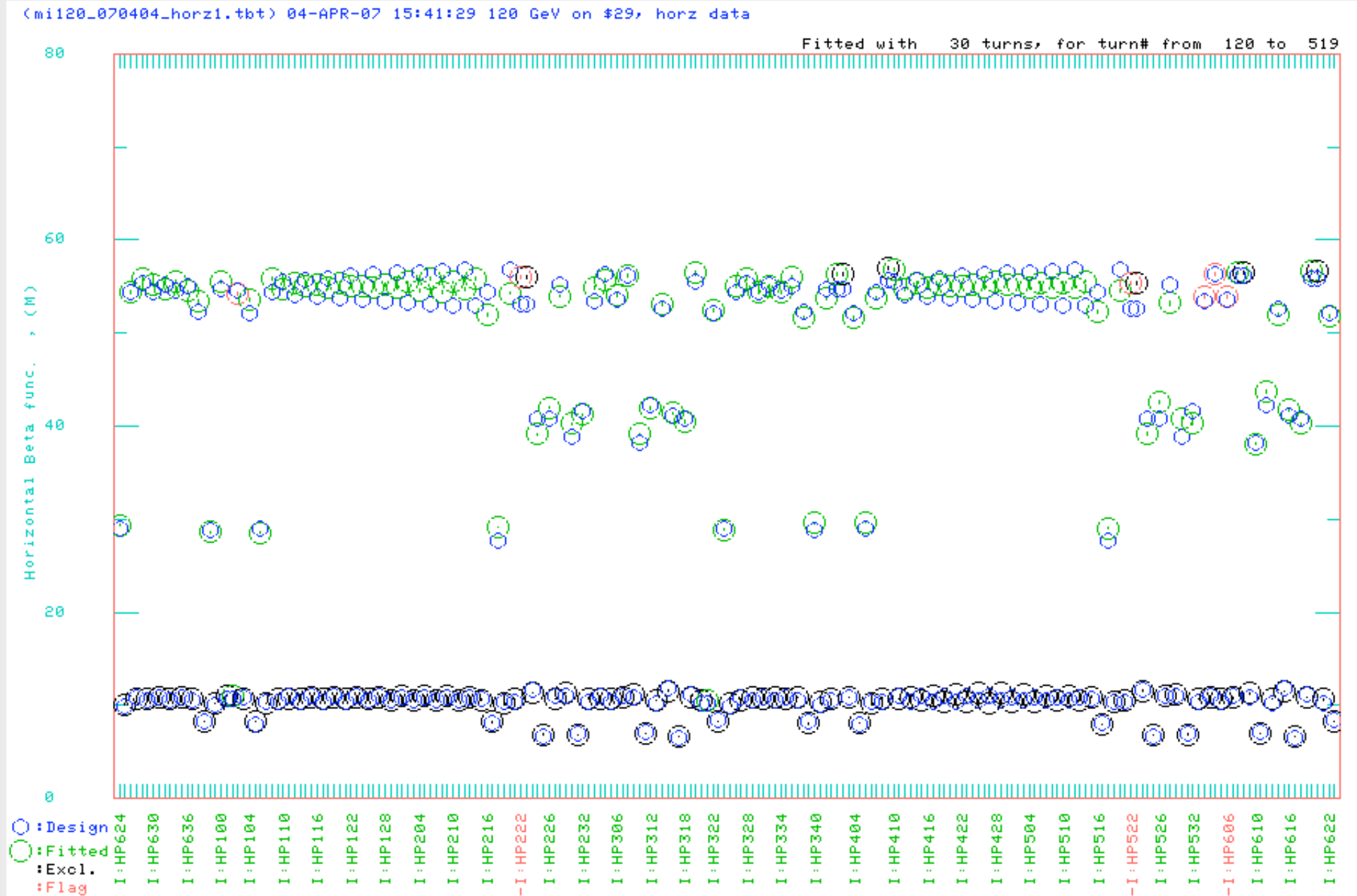
First 5 turns of TBT data, MI horizontal



First 5 turns of TBT data, MI vertical



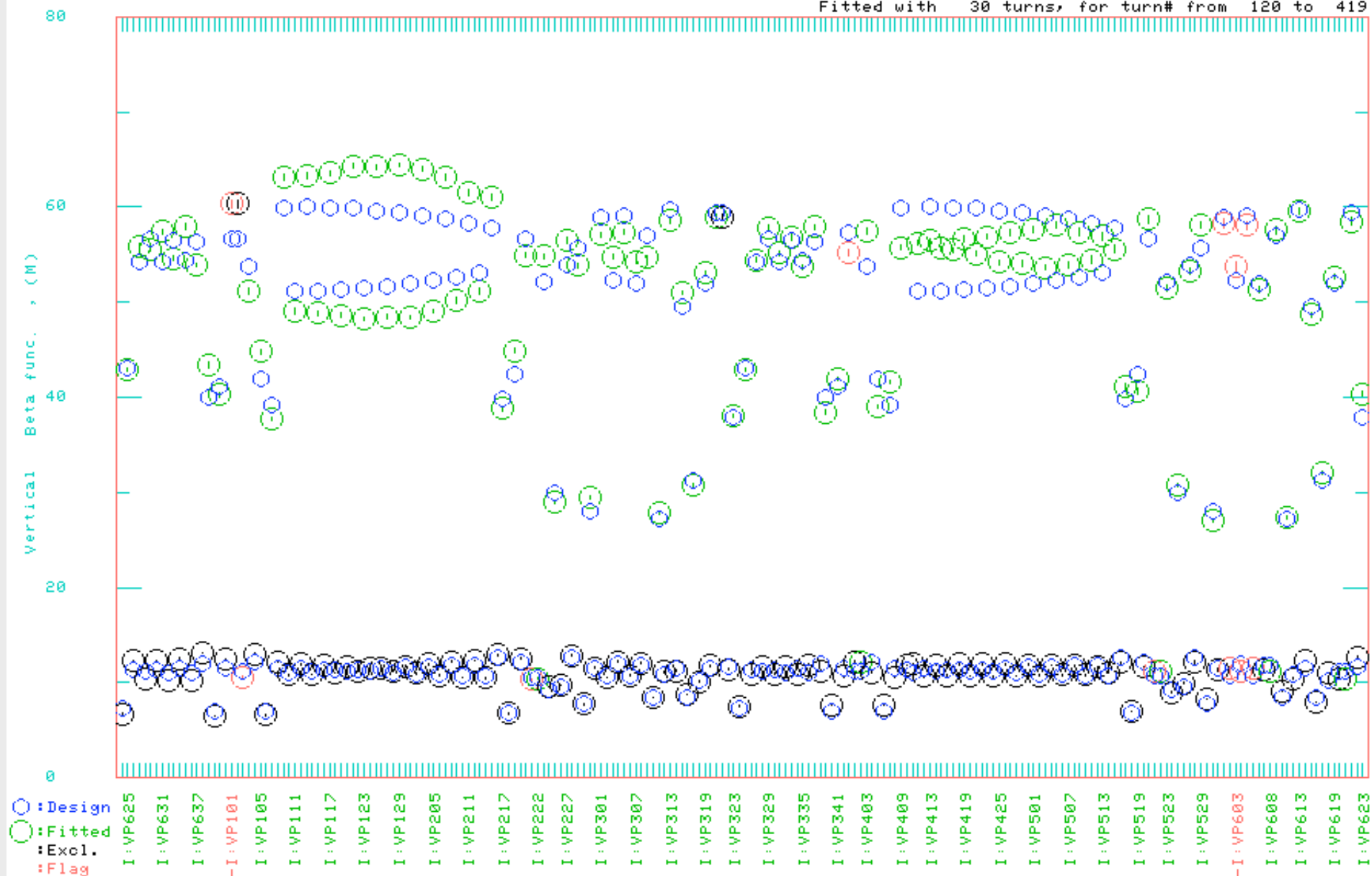
MI beta at 120 GeV, horizontal



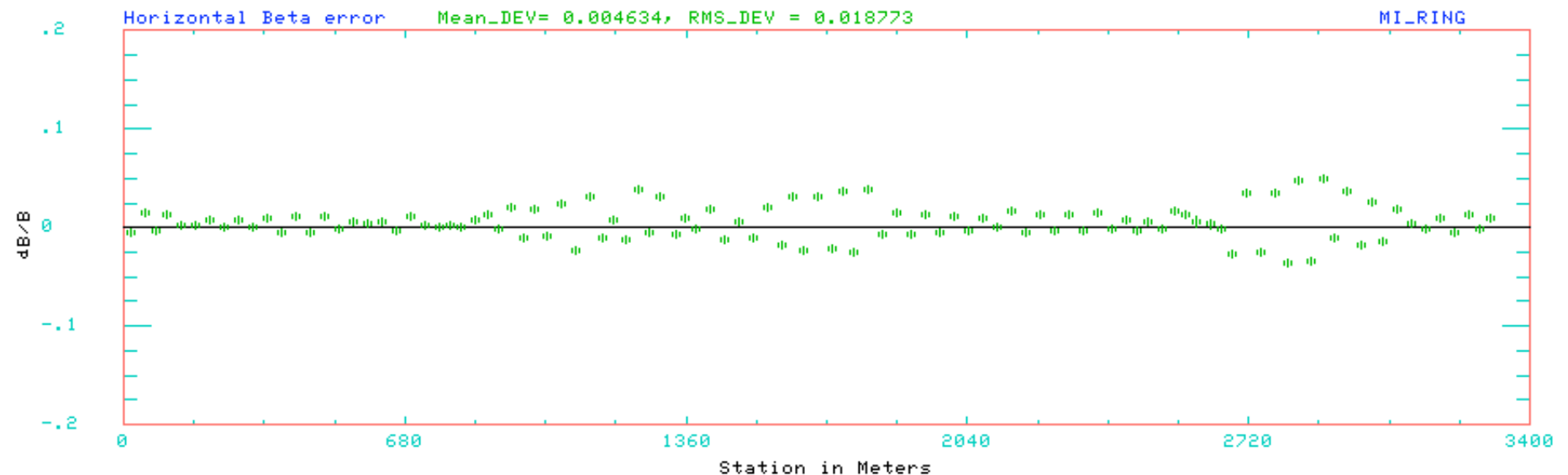
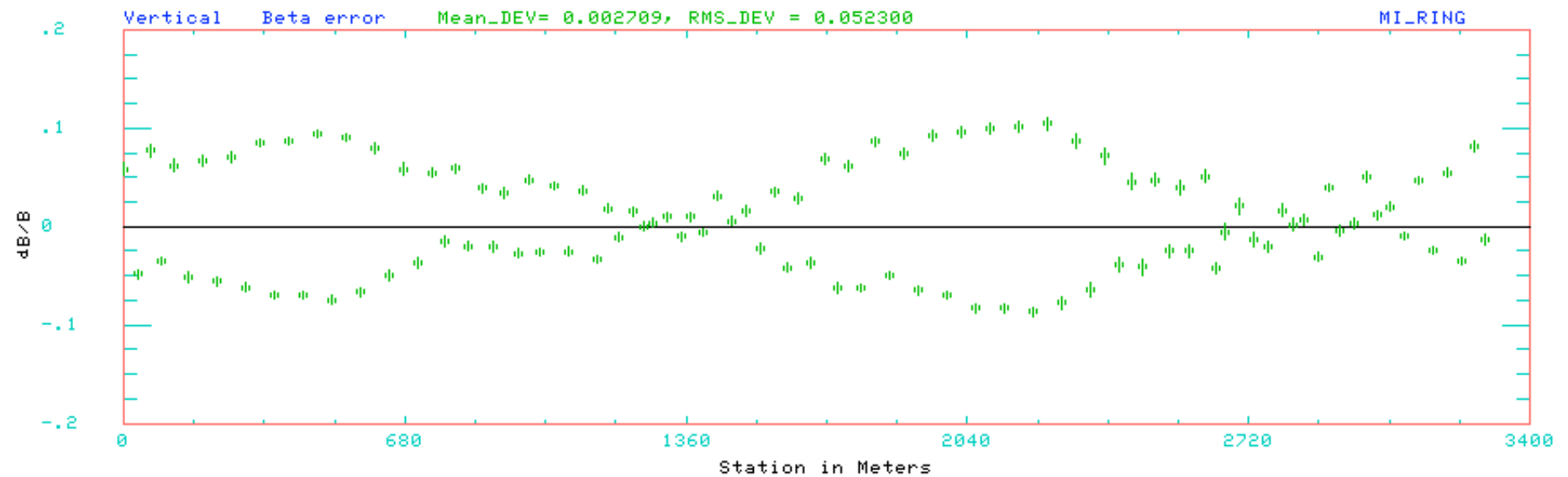
MI beta at 120 GeV, vertical

(mi120_070404_vert2.tbt) 04-APR-07 16:14:26 120 GeV on #29, vert data, 9KV

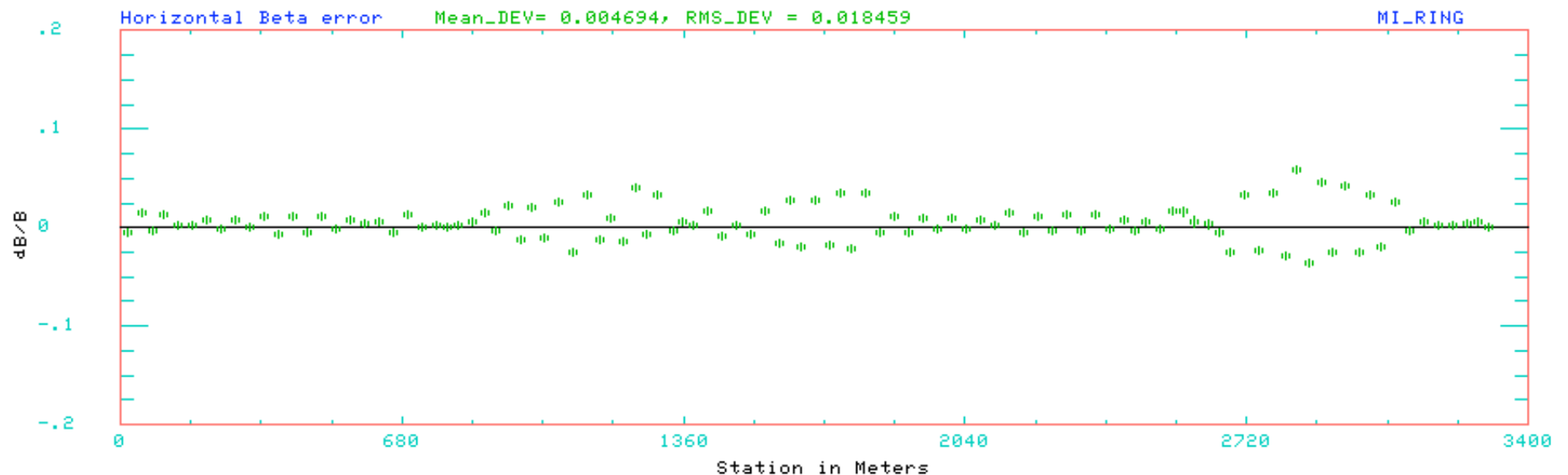
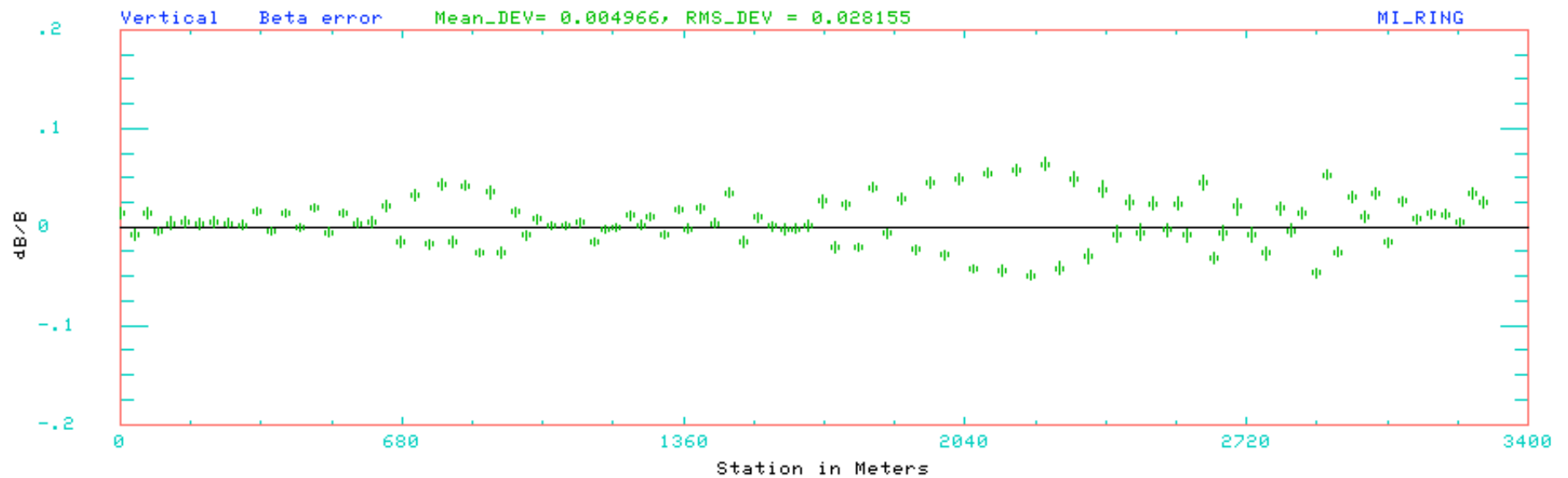
Fitted with 30 turns, for turn# from 120 to 419



Horizontal & vertical Beta errors



Beta error with WQB trim currents



Trim current used for WQB

DB device page

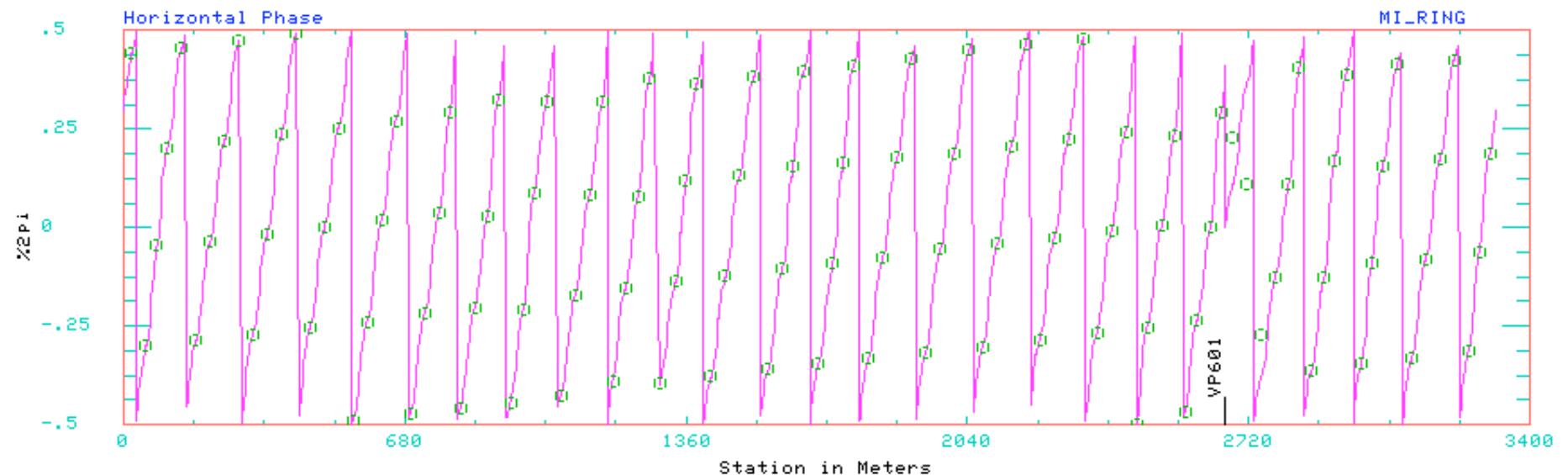
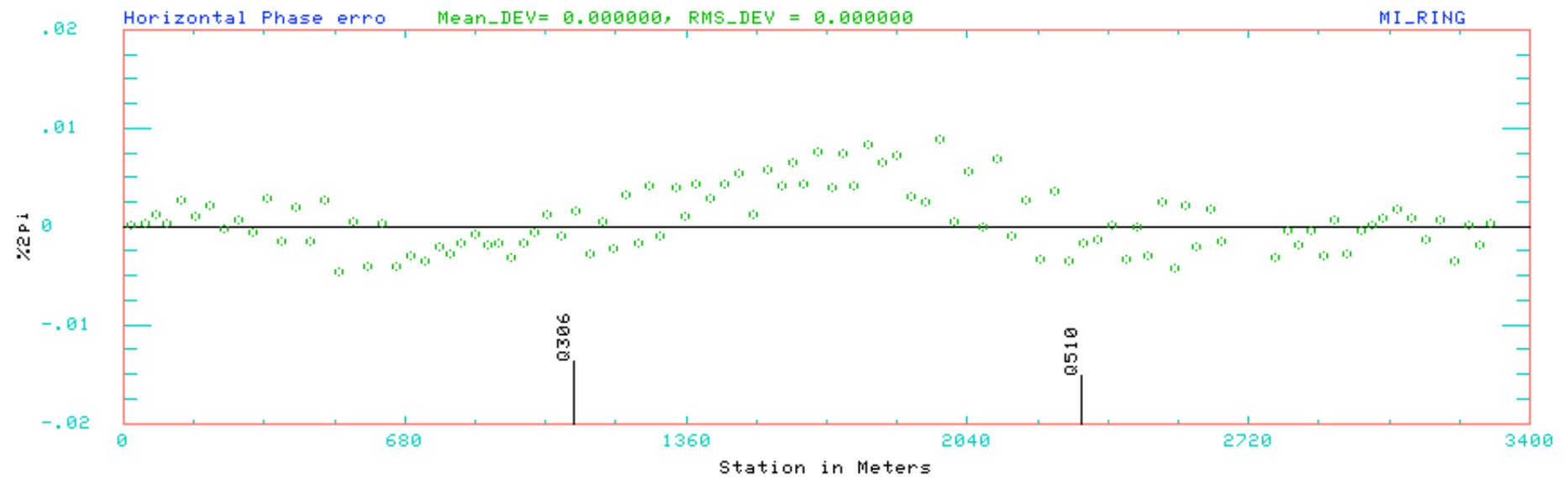
*Page length: [57] *History depth:[15]

DB_name	Setting	prev_set	reading	prev_read
I:IQD	Amps 0		206.0886	206.0881
MIQB_D	Amps 0		-206.0886	-206.0881
MIQC_D	Amps 0		-206.0886	-206.0881
MIQD_D	Amps 0		-206.0886	-206.0881
I:IQF	Amps		210.3989	210.3991
MIQB_F	Amps 0		210.3989	210.3991
MIQC_F	Amps 0		210.3989	210.3991
MIQD_F	Amps 0		210.3989	210.3991
I:QT101	Amps 0	2		1.9
I:QT222	Amps 0	0		-.2
I:QT321	Amps 0	-1.2		-1.1
I:QT402	Amps 0	0		.4
I:QT522	Amps 0	.4		0
I:QT608	Amps 0	1.6		0
I:QT620	Amps 0	-1.1		0

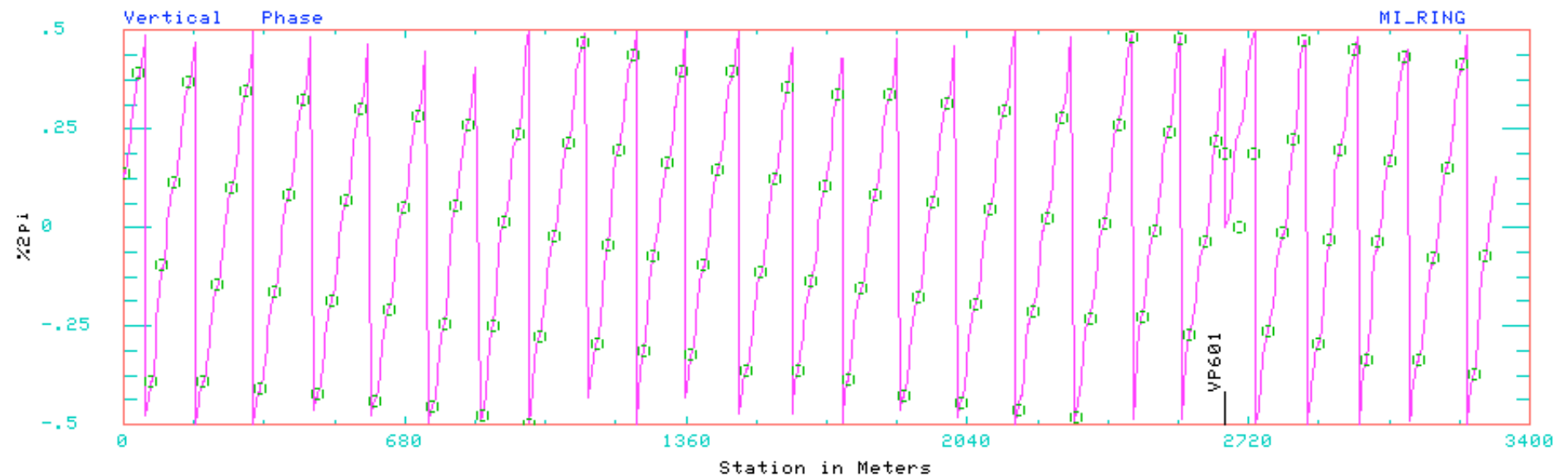
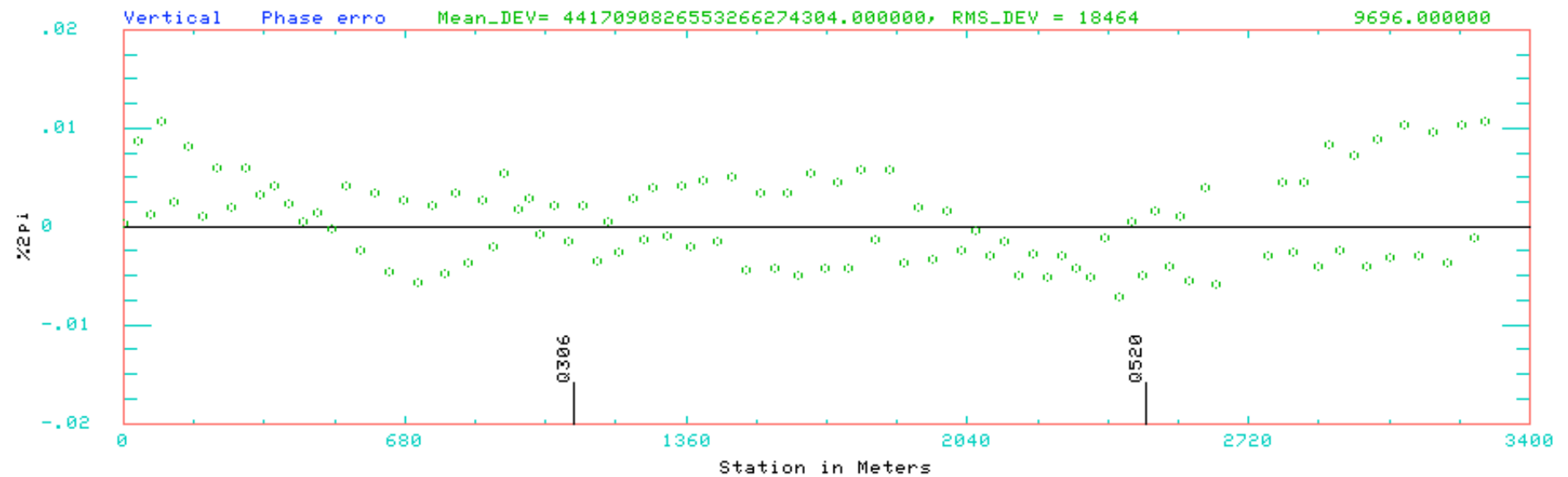
<Exit> 8:27 of 57

adjusted to get
operation tune

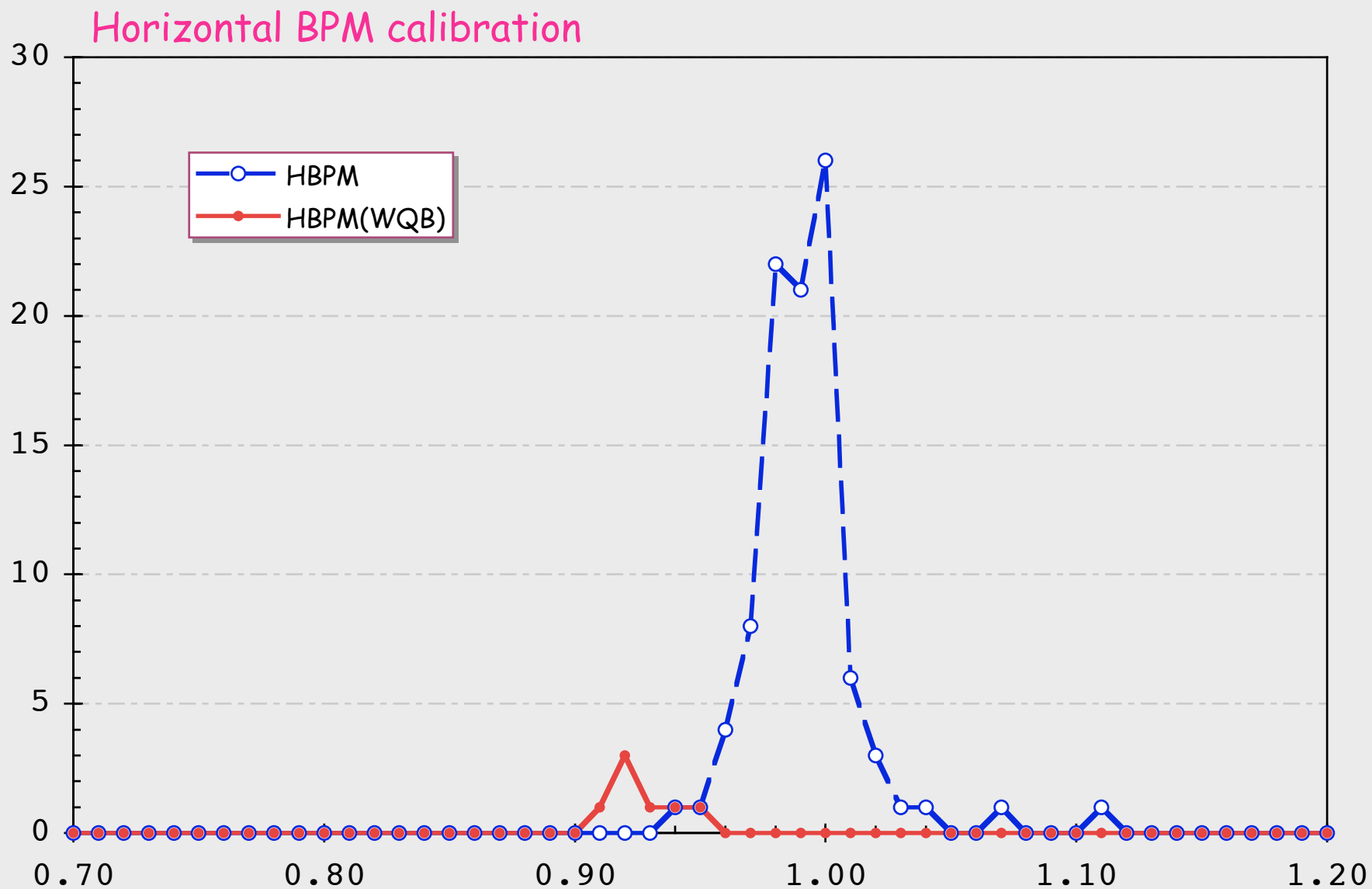
Horizontal phase advances



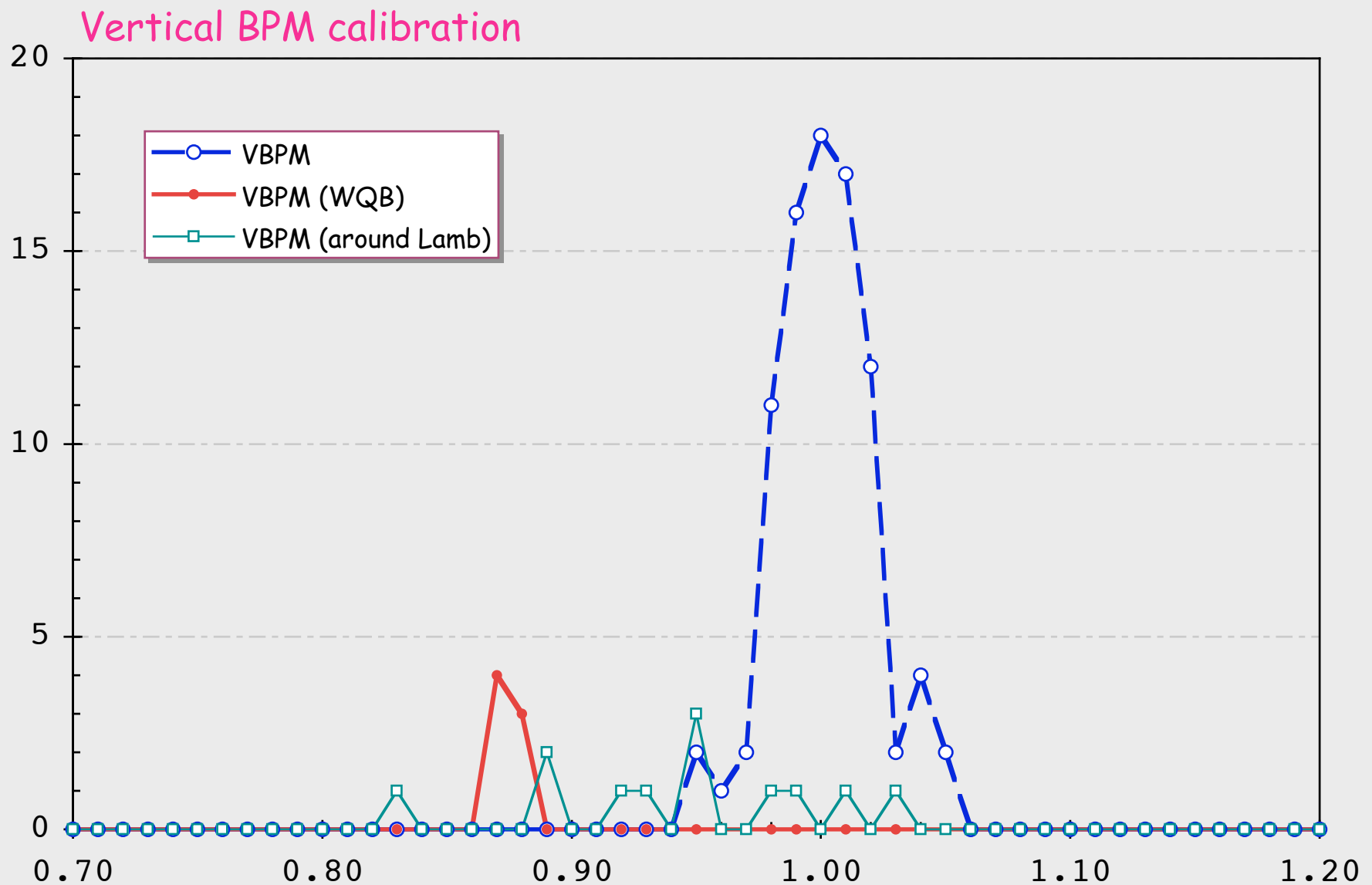
Vertical plane phase advances



Horizontal plane BPM calibration



Vertical plane BPM calibration



Data problems

❖ MI60S BPM

- ▶ from VP601 to HP606
 - 3 in each plane.
- ▶ Database modification was over-written.
 - Sep. 19, 2006: Echotek card was added.
 - Oct. 3, 2006: MI60S database devices updated.
 - Oct. 25, 2006: Data taken and working.
 - Nov. 14, 2006: Update was wiped out.
 - Nov. 20, 2006: Data taken indicated problem.

❖ HP532

- ▶ Setup up error
 - Lattice function at VP531 was wrong.
- ▶ Consequence to HP532
 - phase advance was off by one whole MI turn.
 - Only one affected
 - The last before BPM seam at VP601.

Lattice result

❖ Horizontal plane

- ▶ ~5% in $\Delta\text{beta}/\text{beta}$

❖ Vertical plane

- ▶ >10% in $\Delta\text{beta}/\text{beta}$

❖ Adjusting trim current on WQB

- ▶ Vertical error reduced to just over 5%.
- ▶ Horizontal error unchanged.
- ▶ Beta plot

- URL:

http://www-ap.fnl.gov/~yang/MI/MI120G_latt_070404/mi120_beta_ringwide.gif

- Legend:

Cyan trace: result with trim currents in WQB.

Red trace: standard calculation result.

Green circles: measured beta function.

BPM calibration

- ❖ For all regular MI BPMs
 - ▶ Most within $\pm 0.5\%$ of average.
- ❖ WQB BPMs
 - ▶ Vertical is off by $\sim 11\%$.
 - ▶ Horizontal is off by $\sim 7\%$
- ❖ Vertical BPM around Lambertson location
 - ▶ Not as clear cut.
 - ▶ Still substantial around 608.